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(54) Title of Invention

Liquid crystal panel having drivers therein

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SPECIFICATION

1. Title of the Invention

Liquid crystal panel having drivers therein

2. Scope of Claim for Patent

A liquid crystal panel having drivers therein constructed in such a manner that liquid crystal is interposed between an active matrix substrate having drivers therein which has a plurality of data lines and a plurality of timing lines which perpendicularly intersect, in which a switching element and an image electrode that is driven by said switching element are provided at each cross point of said data line and said timing line, and in which driving circuits for at least one of said data line and timing line are formed on the same substrate, and an opposite electrode substrate which faces to said substrate in parallel, characterized in that said

opposite electrode substrate is widened so as to cover a portion of the driving circuits on said active matrix substrate having the drivers therein and the driving circuits are covered by said both substrates and resin.

3. Detailed Description of the Invention

[Industrial use of the Invention]

The present invention relates to a structure of a liquid crystal panel having drivers therein.

[Prior Art]

When an insulated gate type MOS transistor or a thin film transistor is used as a switching element of an active matrix substrate, a driving circuit can be built on the same substrate, so that there is an advantage that peripheral circuits can be easily mounted.

Fig. 2 is a schematic diagram of an active matrix substrate having therein drivers for a liquid crystal display comprising thin film transistors arranged in a matrix manner on an insulating substrate and peripheral driving circuits. Reference numeral 1 (G1 to Gm) denote gate lines serving as timing lines and reference numeral 2 (S1 to Sr) denote source lines serving as data lines. Data is written into each pixel electrode 4 by each thin film transistor 3 arranged at its cross point. Reference numeral 5 denotes a timing line driving circuit and reference numeral 6 denotes a data line driving circuit. The diagram shows a case of a both-side driving.

Fig. 3 shows a schematic cross sectional view (a) and a plan view (b) of a conventional liquid crystal panel having drivers therein. An active matrix substrate is constructed in such a manner that on an insulating substrate 7, a panel display area 8 comprising thin film transistors, wirings, and pixel electrodes, timing line driving circuits 5 for driving the timing lines 1, data line driving circuits 6 for driving the data lines 2, and peripheral connecting terminals 9 are formed. As an opposite electrode substrate, opposite electrodes 11 are formed on an insulating opposite substrate 10. After both of the substrates are subjected to orientation treatment, a sealing material 13 for sealing liquid crystal 12 is pattern-printed onto the side of

the opposite substrate and both of the substrates are combined. After that, when liquid crystal is injected from an injecting port 14, a liquid crystal panel is formed. Since peripheral driving circuits are exposed in an external atmosphere, it is necessary to protect the peripheral driving circuits from moisture by previously forming a passivation film 15 or performing a resin molding or the like after completion of the formation of the panel.

[Problems sought to be Solved by the Invention]

In the above-mentioned conventional technique, however, if there is a variation in thickness of the resin mold, a moisture resistant protection for the peripheral driving circuits is incomplete. When a mechanical stress such as a scratch is applied onto the resin mold, there is such a problem that a device break is caused, so that the treatment requires circumspection.

The invention intends to solve the problems. It is an object of the invention to provide a structure of a liquid crystal panel having drivers therein in which peripheral driving circuits can be sufficiently protected from moisture and a mechanical stress.

[Means of Solving the Problems]

A liquid crystal panel having drivers therein of the invention is constructed in such a manner that liquid crystal is interposed between an active matrix substrate having drivers therein which has a plurality of data lines and a plurality of timing lines which perpendicularly intersect, in which a switching element and a pixel electrode that is driven by the switching element are provided at each cross point of the data line and timing line, and in which driving circuits for at least one of the data line and timing line are formed on the same substrate and an opposite electrode substrate which faces to the substrate in parallel, characterized in that the opposite electrode substrate is widened so as to cover a portion of the driving circuits on the active matrix substrate having the drivers therein and the driving circuits are covered by both the substrates and resin.

[Operation]

With such a construction of the invention, the peripheral driving circuits on the active matrix substrate having the drivers therein is protected from mechanical stresses (scratch,

damage, and the like) by the opposite electrode substrate. By filling enough resin into a portion between both the substrates or covering the periphery, stable and constant moisture resistance can be maintained.

[Embodiment]

Fig. 1 shows a schematic cross sectional view (a) and a plan view (b) of a liquid crystal panel having drivers therein showing an embodiment of the invention. It differs from the conventional panel in Fig. 3 with respect to a point that an opposite electrode substrate having the opposite electrodes 11 on the opposite substrate 10 is extended up to the tops of the timing line driving circuits 5 and data line driving circuits 6, so that the peripheral driving circuits are protected from a mechanical stress. Further, moisture resistance of the peripheral driving circuits is also improved by molding the periphery by resin 16. As for the resin 16, such a double-layer structure that resin of low viscosity is filled into a hollow portion 17 on the peripheral driving circuits and, further, the periphery is covered by resin of high viscosity can be also formed.

As an active matrix substrate, when a transparent substrate is used as an insulating substrate as shown in the embodiment, a transparent liquid crystal panel using thin film transistors can be realized. In addition to it, when an opaque semiconductor substrate is used, a reflecting type liquid crystal panel using MOS transistors can be also realized.

[Effects of the Invention]

As described above, according to the invention, there are the following effects.

First, since the peripheral driving circuits are covered by the opposite electrode substrate, there is no case where a device portion are damaged or stained, so that the treatment is easy and a reliability is improved.

Second, since a large quantity of peripheral resin molding is uniformly formed, the moisture resistance is improved.

4. Brief Description of Drawings

Figs. 1 (a) and (b) show a schematic cross sectional view (a) and a plan view (b) of a

liquid crystal panel having drivers therein showing an embodiment of the invention;

Fig. 2 is a circuit schematic diagram of an active matrix substrate having drivers therein;
and

Figs. 3 (a) and (b) show a schematic cross sectional view (a) and a plan view (b) of a conventional liquid crystal panel having drivers therein.

- 1... Timing line (gate line)
- 2... Data line (source line)
- 3... Thin film transistor
- 4... Pixel electrode
- 5... Timing line driving circuit
- 6... Data line driving circuit
- 7... Insulating substrate
- 8... Panel display area
- 9... Peripheral connecting terminal
- 10... Opposite substrate
- 11... Opposite electrode
- 12... Liquid crystal
- 13... Sealing material
- 14... Injecting port
- 15... Passivation
- 16... Resin
- 17... Hollow portion

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